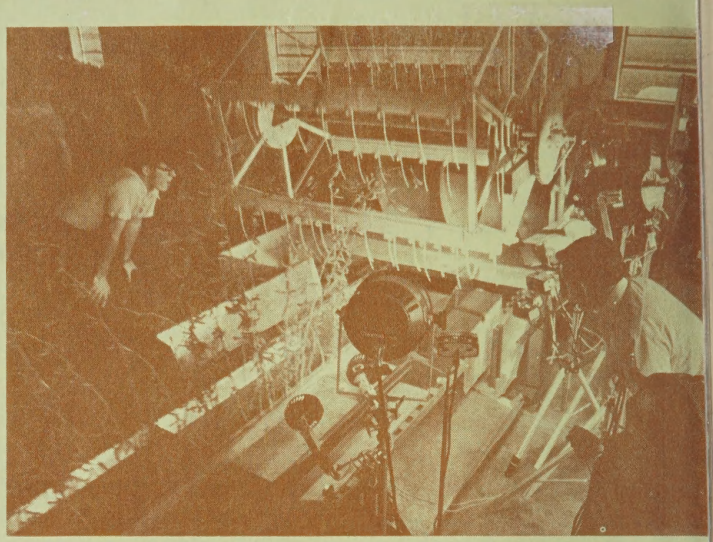
U.S. Regional Soybean Laboratory

Corn and Small Grain

Automatic Livestock Feeding

Soil-Water-Plants

Agricultural Research Service
U.S. Department of Agriculture
Urbana, Illinois



Movie camera records feeding of soybean stalks into harvester reel and cutterbar in laboratory test. In slow motion, film enables agricultural engineers to determine reasons for harvest losses by combine.

Helping growers improve soybean yields and the quality of food crops are the major Agricultural Research Service (ARS) efforts of scientists and agricultural engineers at Urbana, Ill. One of the major efforts of these ARS scientists is soybean research. The United States produces roughly 69 percent of the world's soybeans. Of this, 65 percent are produced in the 13-state North Central Region. This production provides 45 percent of the world's soybean supply.

Other research, also administered by ARS, includes studies of virus diseases of oats and wheat, mechanization of livestock feeding, and the soil-water-air relation to plants.

The research efforts being carried out by ARS scientists in Urbana in cooperation with the Illinois Agricultural Experiment Station range from the most practical to those that are basic and fundamental in nature. ARS researchers maintain office and laboratory space on the University of Illinois campus in University buildings as well as USDA facilities. Scientists hold joint appointments with the University, and they advise and direct graduate students and occasionally teach courses.

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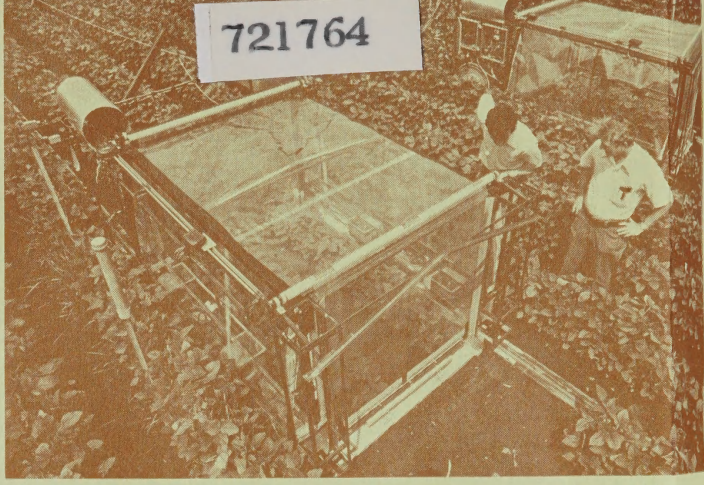
The Laboratory's soybean germplasm collection is one of the most complete in the world, containing more than 3,000 entries. The germplasm collection represents the genetic seed bank from which researchers from all over the world may develop new breeding lines and varieties that are needed for soybean production.



Photosynthesis, evaporation and respiration being measured simultaneously by scientist to help solve the secrets of soybean yields.

For uniform testing of soybeans in slightly different environments, plant breeders and agronomists at the Regional Laboratory coordinate their studies with those of researchers at other State agricultural experiment stations. The Laboratory scientists make oil and protein analyses of seed samples for ARS plant breeders as well as for plant breeders in public research institutions in the United States and Canada.

To help match soybean yields with increasing world demand, scientists combine studies on breeding and such cultural practices as narrow rows and double cropping. For example, semidwarf lines are being developed that resist lodging and produce high yields in 7-inch rows.

The practice of growing soybeans in narrow rows is increasing in the Midwest — a trend made possible from combinations of herbicides and tillage practices. In research to refine integrated systems for weed control (combinations of cultural, mechanical, and chemical techniques), ARS weed scientists observe in weeds, and the crop, the differences in biological processes, physical characteristics, and competitiveness.

Research on equipment for preparing seedbeds and planting with more precision is also an integral part of the work being carried out to help farmers obtain higher soybean yields. Equipment research is conducted to enable growers to harvest soybeans with little field loss and to reduce labor and machinery costs as well as protect soybeans from mechanical damage.

Soybean root rots and foliar diseases are studied by plant pathologists at Urbana. As they gain more knowledge about soybean diseases, techniques are improved to screen breeding lines of soybeans for resistance to the various diseases.

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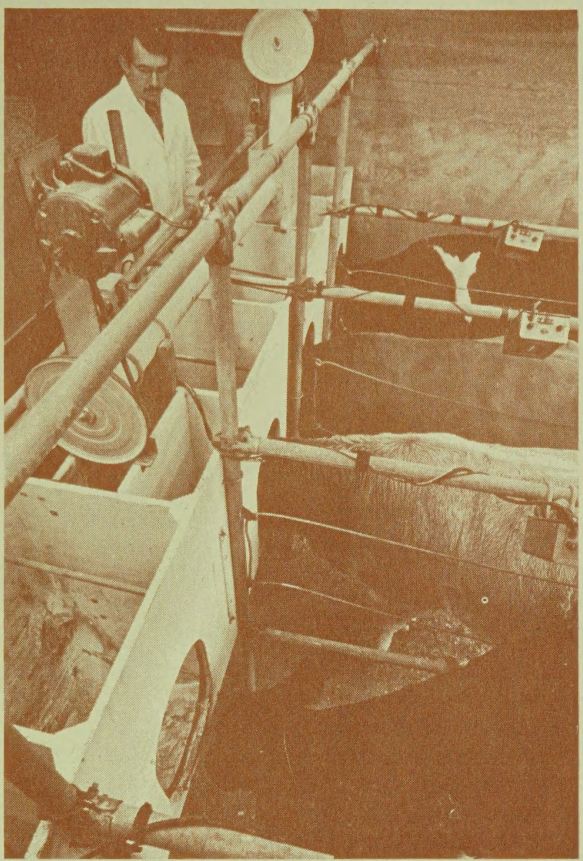


Scientist monitors electronic feed dispenser for dairy cows. With this automatic system, transponder-fitted cows may eat at any time during computed, 12-hour, feeding schedule.

Scientists also screen breeding lines for resistance to the soybean cyst nematodes. Fundamental studies on the biology of pests and on evaluations of nematicides and cultural practices are an important part of the disease control efforts. This research program is designed to provide growers more protection against losses from new races of the soybean cyst nematodes that may threaten major soybean-producing areas in the future.

Biological processes of the soybean plant — photosynthesis, nitrogen fixation, and the synthesis of oil and protein — are studied as they affect the quantity and quality of soybean products. A major effort is to improve the photosynthetic efficiency of the soybean plant. The basic processes in photosynthesis are being studied, and soybean plants are screened in growth chambers to find those that are photosynthetically more efficient. The scientists are also studying the fundamental processes in nitrogen metabolism; they are growing soybean plants in nutrient culture in field studies to help accomplish this goal. These fundamental findings may lead to technology for improving yields as well as for developing soybeans with specific chemical compositions for tomorrow's markets.

Corn and Small Grain

In corn research, scientists are seeking knowledge about the synthesis of protein and oil in the seed in an effort to identify new experimental lines having higher levels of protein and improved nutritional quality. Research on corn's inherited ability to produce oil with variable amounts of saturated and unsaturated fatty acids may affect human nutrition.

In research on virus diseases of oats, plant pathologists are defining the relation among viruses, insects, and plants. This knowledge will be useful in developing experimental varieties of oats that resist viruses. The scientists hope to learn enough about viruses in oats to develop new controls for other crops infected by the same viruses. Both spring oats and winter wheat are tested for resistance to a variety of diseases.

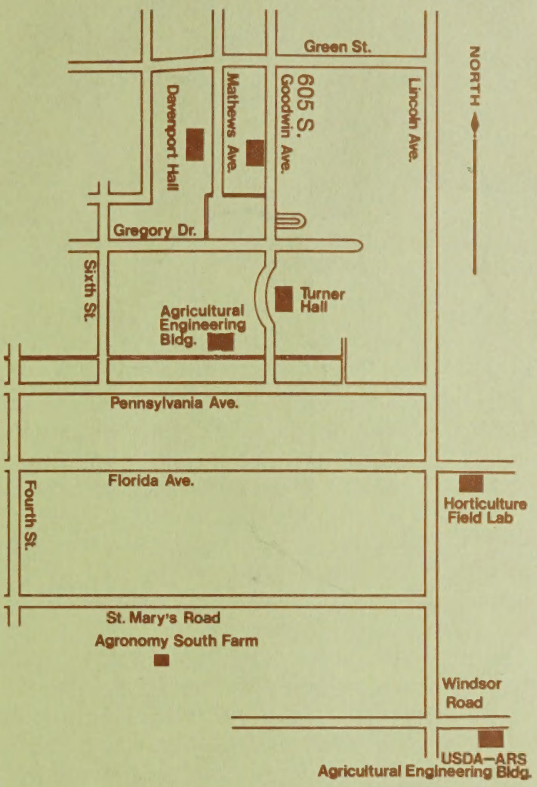
Automatic Livestock Feeding

Agricultural engineers are investigating mechanical innovations for feeding and managing farm animals. Research on this management approach requires the extensive use of computers, electronics, quality-control devices, electrical systems, material-handling equipment and engineering know-how. The long-range goal of this research, involving computer-aided management techniques, is to increase the number of animals that a dairyman can effectively manage.

Automatic systems for mixing and feeding forages and concentrates to groups of sheep are being studied by the ARS scientists at the Dixon Springs Agricultural Center, Simpson, Ill. This system will deliver silage and one or more proportional supplements to 28 reading locations. To make the system operational, all that is required is (1) choose the locations, (2) define the ration to be delivered, (3) reset the electronic scale, and (4) turn on the system. The control system will then deliver the ration and shut itself off.

Soil-Water-Plants

Soil scientists and plant physiologists study responses of plants to environmental variables in the laboratory and in the field. Field equipment has been designed to measure photosynthesis, evaporation and dark respiration in natural field situations. Gaining a better understanding of these plant responses, soil-water stress, and effects of temperature on plants throughout the growing season may lead to improved crop screening for productivity and more refined crop management systems.



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